

## CLAIMS

Therefore, having thus described the invention, at least the following is claimed:

- 1 1. A waveguide comprising:  
2 a waveguide core, and  
3 an air-gap cladding engaging a portion of the waveguide core.
- 1 2. The waveguide of claim 1, wherein the waveguide core includes at least one  
2 coupling element.
- 1 3. The waveguide of claim 1, further comprising:  
2 at least one coupling element disposed adjacent to the waveguide core.
- 1 4. The waveguide of claim 1, further comprising:  
2 a second waveguide cladding adjacent to the waveguide core.
- 1 5. The waveguide of claim 1, further comprising:  
2 a second waveguide core.

- 1 6. A device, comprising:  
2 a waveguide having a waveguide core and an air-gap cladding  
3 engaging a portion of waveguide core.
- 1 7. The device of claim 6, wherein the waveguide is included in a microelectronic  
2 device.
- 1 8. The device of claim 6, wherein the waveguide is included in an integrated  
2 optical device.
- 1 9. The device of claim 6, wherein the waveguide is included in a photonic crystal  
2 device.

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1 10. A method for fabricating a waveguide comprising:  
2 (a) providing a substrate having a lower cladding layer disposed on the  
3 substrate;  
4 (b) disposing a waveguide core on a portion of the lower cladding  
5 layer;  
6 (c) disposing a sacrificial layer onto at least one portion of the lower  
7 cladding layer and the waveguide core;  
8 (d) disposing an overcoat layer onto the lower cladding layer and the  
9 sacrificial layer; and  
10 (e) removing the sacrificial layer to define an air-gap cladding layer  
11 within the overcoat polymer layer and engaging a portion of the waveguide  
12 core.

1 11. The method of claim 10, further including:  
2 disposing an optical grating layer adjacent to the waveguide core after  
3 (b) and before (c).

- 1 12. A method for fabricating a device comprising:
- 2 (a) providing a substrate;
- 3 (b) disposing a waveguide core on a portion of the substrate;
- 4 (c) disposing a sacrificial layer onto at least one portion of the substrate
- 5 and the waveguide core;
- 6 (d) disposing an overcoat layer onto the substrate and the sacrificial
- 7 layer; and
- 8 (e) removing the sacrificial layer to define an air-gap cladding layer
- 9 within the overcoat polymer layer and engaging a portion of the waveguide
- 10 core.

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- 1     13.     A system for fabricating a waveguide comprising:
  - 2                     (a) means for providing a substrate having a lower cladding layer  
3                     disposed on the substrate;
  - 4                     (b) means for disposing a waveguide core on a portion of the lower  
5                     cladding layer;
  - 6                     (c) means for disposing a sacrificial layer onto at least one portion of  
7                     the lower cladding layer and the waveguide core;
  - 8                     (d) means for disposing an overcoat layer onto the lower cladding layer  
9                     and the sacrificial layer; and
  - 10                    (e) means for removing the sacrificial layer to define an air-gap  
11                    cladding layer within the overcoat polymer layer and engaging a portion of the  
12                    waveguide core.

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